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DRAWINGS ATTACHED

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(54) SPRING SUSPENSION

(71) We, CRANE FRUEHAUF TRAILERS LIMITED, a British company, of South Green Works, Dereham, Norfolk, do hereby declare

the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention is concerned with the spring suspensions of vehicle bodies.

The present invention provides a spring suspension mounted between an axle and a vehicle body having side frame members upon which are mounted front and rear hanger brackets having hard wear plates thereon, said suspension comprising at each side of the vehicle a main leaf spring having its ends engaged with said wear plates and secured, together with an eye-leaf, to said axle, said eye-leaf having a wrapped eye forcibly moved into and secured to one of said hanger brackets to prestress the leaf spring assembly.

The main leaf spring may be a single leaf or a set of multiple stepped leaves. Preferably, the leaves are tapered at their ends and are spaced apart by spacers, preferably of the material sold under the Registered Trade Mark DELRIN.

In one embodiment of the invention a square axle has a seat on the top of which an assembly of spring leaves is secured by oppositely sloping U-bolts engaging a saddle above the assembly which clamp the leaves together and to the seat. A wrapped-eye leaf spring has one end portion clamped against the seat and its eye end portion extended forwardly in a substantially horizontal position when in the unstressed state. The eye is forced upwardly and secured to a hanger bracket in elastomeric bushings to prestress the leaf spring assembly. The spring leaves are tapered outwardly at the ends to provide a constant stress beam and the longest top leaf has its ends bent downwardly with the adjacent portions bearing against hard steel surfaces on a vehicle body which offer excellent wear resistance. The center of the spring leaves and the free end of the eye leaf have aligned apertures and bosses which interlock with each other and prevent the leaves from moving relative to each other. Such bosses may be formed by offsetting the material around the apertures to provide a boss on one face and a corresponding recess on the other. Spacers, preferably of DELRIN (R.T.M.) having central apertures surround the bosses at the centre of the leaves and permit the leaves to come into contact with each other only at their outer ends which reduces interleaf friction and thereby improves the ride characteristics since the leaves can react in a faster manner. The eye leaf spring performs the same function as a radius rod and adds resilience to the assembly. It reduces wear, shock and maintenance and carries the fore and after stresses while providing greater lateral stability to the load on the vehicle.

The multiple assembly functions as a thick tapered spring beam. The Delrin spacers between the leaves reduce interleaf friction and so increase the life and eliminate the need for additional springs to satisfy light and heavy duty applications.

A preferred form of the invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a broken front view of a trailer having a spring assembly between the wheel axle and frame embodying features of the present invention;

Fig. 2 is a side view of the spring assembly illustrated in Fig. 1, as viewed from the point 2 thereof;

Fig. 3 is an enlarged broken sectional view of the structure illustrated in Fig. 2 taken on the line 3—3 thereof; and

Fig. 4 is an enlarged broken sectional view of the structure illustrated in Fig. 2 taken on the line 4—4 thereof.

A trailer body 11 is illustrated in Fig. 1 having side frame members 12 supported by spring units 13 from an axle 26 having wheels 14 on the ends thereof. A forward

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hanger bracket 15 is welded to the bottom web of each of the members 12 and each is constructed from a pair of flanged side plates 16 spaced by a pair of plates 17 and a central wear plate 18 of heat treated high strength steel.

Below the wear plate 18 the plates 16 have aligned tapered sleeves 19 welded thereto for supporting flexible elastomeric bushings 21. Rear hanger brackets 22 are secured to the members 12 rearwardly of the front hanger brackets 15 and have a heat treated cast steel web 23, which is wear resistant. From the web 23, a pair of ears 24 extends downwardly to confine the end of the main springs which is retained therebetween by a bolt 25 which extends through apertures in the end of the ears.

The wheels 14 are supported at the ends of the square axle 26 which provides substantially more strength than an axle made of a cylindrical tube. A seat 27 for the leaf spring is welded to the top of the axle inwardly from each end thereof. The seat engages the top corners 28 of the axle so that radial forces thereat are transmitted downwardly through the side walls 29 providing uniform loading of the axle.

The leaf spring assembly 13 has a top leaf 31, an intermediate leaf 32 and a bottom leaf 33 along with a wrapped-eye leaf 34. The spring leaves 31, 32 and 33 at their center and the eye-leaf springs 34 at its end remote from the eye each have an aperture therethrough with portions 35 thereabout upset from the material of the leaf. The portions 35 provide shoulders 36 for spacer pads 37 located between the leaves 31, 32 and 33 and on the top of the main leaf 31. The offset portions 35 prevent the spring leaves from shifting relatively to each other when clamped together. A forged steel saddle 38 has contoured recesses 39 which are engaged by a pair of U-bolts 41, legs 42 of which extend through apertures 43 in the seat 27. The ends of the legs are threaded and have washers 44 and nuts 45 screwed thereon to tightly clamp the saddle 38, pads 37 and leaves 31, 32 and 33 and the eye leaf 34 in fixed relation to each other and to the top of the seat 27.

The upper ends of the U-bolts 41 slope toward each other and when the leaf spring assembly 13 is supported in the hangers 15 and 22, a wrapped-eye 46 on the end of the eye-leaf 34 extends below the tapered sleeves 19 with the leaf in a substantially horizontal position as illustrated in dot and dash line. This requires the wrapped-eye to be forced into alignment with the sleeve 19 to prestress the leaf spring assembly. The eye 46 has tapered surfaces 47 extending inwardly from each end to a central cylindrical surface 48. A cylindrical sleeve 49 is disposed in the eye 46 in engagement with the central cylindrical portion 48 thereof. During assembly the two bushings 21 are lubricated and immediately inserted through each of the tapered sleeves 19 and into the tapered surfaces 47 of the eye 46, as clearly illustrated in Fig. 4. The bushings are secured to cylindrical sleeves 51 which are moved into engagement with the central cylindrical sleeve 49. It is to be understood that a headed bolt could draw the two bushings 21 together when a nut and washer is applied to the threaded end.

A sleeve 52 is herein illustrated extending through the sleeves 49 and 51 having the end walls reduced in thickness and flanged over end washers 53 after the sleeves 49 and 51 have been moved into abutting relation with each other. The mounting of the eye 46 of the eye-leaf 34 in this manner eliminates wear, reduces shock and maintenance and enables the spring leaf 34 to function as a radius rod for reducing torque and controlling the fore and aft loading of the axle. A spacer plate 54 is welded between the inner surface of the rails 12 and the inner plates 16 of the forward hangers 15 to provide strength and stability thereto.

The leaves are made from chrome-bearing alloy steel and after being cut to length and tapered at each end, the main leaf 31 has its ends bent downwardly substantially at right angles. The central holes and bosses are added, after which the leaves are quenched and tempered to 388 to 444 Brinel hardness which provides a tensile strength of approximately 200,000 psi. The taper on each leaf 31, 32 and 33 causes the assembly to simulate a constant stress beam and the three leaves provide the equivalent of a thick tapered spring beam, the end portions of the leaves 32 and 33 directly engaging the leaf adjacent thereto. The leaf 31 is of the greatest length with hook ends which limit the rebound travel and provide maximum security of retention of the spring in the hangers. The bolt 25 inserted in the downward extending ears 24 of the hanger 22 prevents the spring from moving downwardly to any substantial degree from the web 23. After the leaves 31, 32, 33 and 34 have been formed, they are shot cleaned and immediately rust proofed. When the bushings 21 are to be assembled, they are dipped into a soap-water solution and immediately applied under pressure to have the elastomeric material disposed in firm fixed relation to the sloping surfaces 47 of the eye and the sloping inner surface of the tapered sleeves 19. Since the longitudinal loads are applied centrally of the main leaf, the tendency for the eye to open or unwrap is reduced. The spacers at the centre of the leaf springs permit the leaves to contact each other only at the ends to thereby reduce interleaf friction, and provide improved rid-

ing characteristics since the leaves are permitted to react faster.

WHAT WE CLAIM IS:—

1. A spring suspension mounted between an axle and a vehicle body having side frame members upon which are mounted front and rear hanger brackets having hard wear plates thereon, said suspension comprising at each side of the vehicle a main leaf spring having its ends engaged with said wear plates and secured together with an eye-leaf to said axle, said eye-leaf having a wrapped eye forcibly moved into and secured to one of said hanger brackets to pre-stress the leaf spring assembly.

2. A spring suspension as claimed in Claim 1, in which additional leaf springs are mounted between said main spring and said eye leaf having their ends in engagement with each other and said main leaf spring.

3. A spring suspension as claimed in Claim 2, in which said leaves each have a central aperture with the material thereabout upset to provide a boss on one face and a recess on the other which are engaged to interlock the leaf springs relative to each other.

4. A spring suspension as claimed in Claim 3 in which pads having central apertures to receive the bosses space the central sections of the leaf springs to retain these sections out of contact with each other.

5. A spring suspension as claimed in any of claims 2 to 4 in which the main and additional leaf springs are tapered outwardly from the center towards the ends to simulate a constant stressed beam.

6. A spring suspension as claimed in any of the preceding claims in which the eye is secured in the said hanger bracket on elastomeric bushings.

7. A spring suspension as claimed in Claim 6, in which the eye has a cylindrical center and tapers outwardly to its ends, and tapered sleeves on the said hanger bracket slope towards the eye substantially in continuation of the tapers at the ends of the eye.

8. A spring suspension as claimed in Claim 7, in which a cylindrical sleeve engages the cylindrical center of the eye, and a sleeve on the inner wall of each of said bushings abuts the central cylindrical sleeve when in assembled relation in the eye.

9. A spring suspension as claimed in Claim 8, in which a tube extends through said bushing sleeves and the central cylindrical sleeve, and the tube ends are flanged over a washer on each end of the tube to clamp the eye to said hanger.

10. A spring suspension as claimed in any of the preceding claims in which the axle is square in section, and has a seat on the top thereof, in engagement with the corners of the axle through which the load on the springs is applied downwardly through the axle side walls.

11. A spring suspension as claimed in Claim 10, in which a recessed saddle is applied to the top of the main leaf, and a pair of U-bolts register with recesses of the saddle and provide a clamping force to the saddle, leaves, pads and seat.

12. A spring suspension as claimed in Claim 11, in which said U-bolts slope convergently upwardly towards each other.

13. A spring suspension substantially as described with reference to the accompanying drawings.

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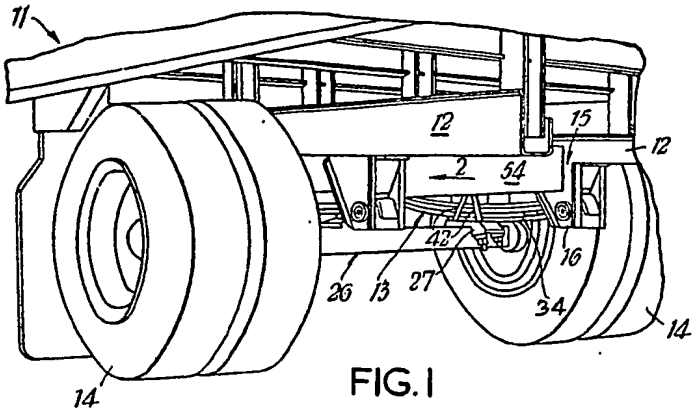

FIG. 1

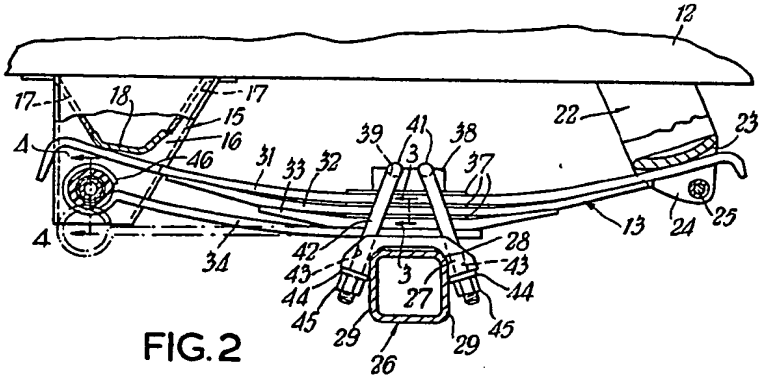

FIG. 2

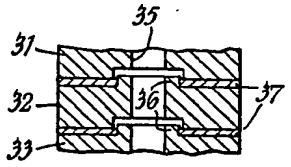

FIG. 3

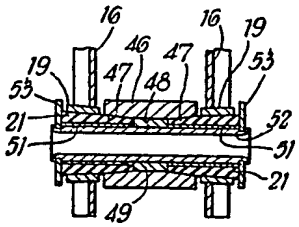

FIG. 4